Development and Benchmarking of a new Kinetic Code for Parallel Plasma Transport in the SOL and Divertor

A.V. Chankin[1], D.P.Coster[1], G.Meisl[1,2]

[1]*Max-Planck-Institut für Pasmaphysik, Boltzmannstraße 2, 85748 Garching bei München, Germany*
[2]*Physik Department, Technische Universität München, 85748 Garching bei München, Germany*

A new kinetic code is presently being developed at IPP Garching to describe parallel (along magnetic field lines) plasma transport in the SOL and divertor of tokamaks. The development of the code is aimed at replacing parallel transport equations used in the present day fluid codes such as SOLPS(B2), EDGE2D, UEDGE. The code is based on the continuum discretization scheme for the Fokker-Planck equation for parallel plasma transport. In the physical space (along B-lines) the fine spatial structure on the scale of the Debye length is not resolved, instead, plasma quasi-neutrality on a much longer scale, controlled by the parallel electron momentum balance equation, is assumed. At the interface with a material surface, logical sheath condition is used. The code initially is 1D2V, with parallel and gyro-averaged perpendicular velocities being independent velocity variables. In the future, extension of the kinetic treatment on ions, and extension of the code dimensionality to 2D2V to cover also radial (across magnetic field lines) dimension is envisaged. Details of the code, together with its benchmarking by comparing code results with analytical theory in the limit of highly collisional plasmas, are presented in the paper.